author has a paper on the Loch Leven trout in the *Journal of the Linnean Society* for this year. He does not, however, come to any decision as to the specific validity of the form in question.

Prof. E. D. Cope describes (*Proc. U. S. Nat. Mus.*, 1887) a new species of Tropidonotus, from Washington, D. C., under the name *T. bisectus*. In its affinities it is nearest to *T. woodhousei*, and the fact that it occurred in a region so carefully studied lends plausibility to the view that it is an introduced species.

Dr. van Lidth de Jeude contributes some notes on a collection of fishes and reptiles from the West Indies to Vol. x. of the Leyden Museum *Notes*. The new species described are *Gymnodactylus antillensis*, *Phyllodactylus martini* (= *P. julieni* Cope), *Cnemidophorus arubensis*, *Crotalus horridus* var. *unicolor*, *Pœcelia vandepolli*, and same var. *arubensis*. A larger acquaintance with American literature would have reduced the number of nominally new species.

EMBRYOLOGY.[1]

Development of the Cœcilians (*Ichthyophis glutinosus*).[2]—The remarkable discoveries of the brothers Sarasin during their sojourn in Ceylon are now in course of publication, and promise to clear up some very important questions in morphology and taxonomy. This is the case with the memoir before us.

After surmounting many discouraging difficulties, the Sarasins have succeeded in presenting a pretty full account of the development of the remarkable, worm-like, limbless salamanders of the genus *Ichthyophis*. The ova are laid in strings, joined together by continuations of the egg-membrane, so as to remind one of a string of beads. The individual ova are quite large, or nearly the size of a marrow-fat pea. There is a considerable albuminous investment to each ovum, and at the points where the ova are joined together there is a well-defined chalaza developed at opposite poles, these chalazæ seeming to join adjacent ova together through the narrow tubular connections formed by their common coverings. The female guards her ova in a burrow, and not the least charming feature of this memoir is the skill with which the famous zoological artist Mützel has succeeded in giving a most spirited rendering of the animal in its burrow coiled about its ova. This effective picture has been composed from photographs taken from life by the authors.

On account of the very large size of the ovum the mode of development differs very considerably from that of other Amphibia, in that a very distinct blastoderm is formed, which slowly invests by epiboly the underlying yelk, as in Elasmobranchs, Reptilia, Teleostei, and Aves. The formation of the embryo

[1] Edited by JOHN A. RYDER, Ph.D., Biological Department, University of Pennsylvania.

[2] Ergebnisse naturwissenschaftlicher Forschungen auf Ceylon. Heft II., 4to. Wiesbaden, 1887. Kreidel.

and the method of infolding of the medullary groove is, however, characteristically amphibian. At the posterior end of the embryonic area the furrows characteristic of the Amphibia appear. As segmentation proceeds, the yelk-granules are taken up into the cells of the blastoderm as they are into the cells of the embryo in other Amphibia, and in Petromyzon, as I am informed by Prof. Scott, of Princeton.

The cranial flexure is profound, and at times the head is well differentiated, the branchial clefts and visceral arches are developed with great distinctness, so that from the side the head presents, at this stage, an appearance which is decidedly like that of an embryo of a bird or a mammal. The last remnants of the yelk are not absorbed below the cardiac region as in Teleosts, but the yelk-sac is carried far back, so as to occupy a position in front of the vent. In this respect there is a resemblance to the mode in which the last remnant of the yelk is absorbed in the Marsipobranchs, on which account the writer has called the latter *opisthotrophous* in reference to this peculiarity. The embryo is also folded off from the yelk somewhat in the same manner as in Marsipobranchs, the head first becoming free and then the trunk. There is a very distinct vascular net-work formed over the yelk at a late stage, much as in *Alytes*, as described by C. Vogt many years ago.

The embryo also becomes coiled up in the ovum, and then, some time before its escape from the egg, three beautiful plumose or pinnate branchial processes grow out from either side in the region of the posterior branchial clefts. These are compared with the plumose branchiæ of the larvæ of *Megalobatrachus japonicus* from Japanese figures. An amended figure of the larva of *Typhlonectes compressicauda*, another Cœcilian, is also given, and the account of Peters, which was based on the same material, corrected. The Sarasins find that the single pair of branchiæ in *Typhlonectes* are not vesicular, as supposed by Peters, but leaf-like.

Another singular feature which the memoir reveals is the presence of vertical tail-folds on the tail of the larvæ of Ichthyophis; these extend forward to the vent, and back over the end of the tail, and forward over the dorsal side a little in advance of a vertical line from the anus.

Still more remarkable is the development of a pair of rudimentary limb-buds, representing the hind limbs, on either side of the vent, or cloaca. These afterwards undergo a retrogressive metamorphosis. The occurrence of a vertical tail-fold in the larva of Ichthyophis reminds one of the development of such structures in adult Urodeles, such as Triton, while the abortive limb-buds prove beyond question that these singularly modified burrowing and worm-like amphibians are undoubtedly descended from types which possessed well-developed ambulatory organs, as proposed by Cope.

The Origin of the Segmental Duct in Elasmobranchs.[1]—J. Beard, in a note in the publication cited, finds that in *Scyllium* and *Torpedo* the segmental duct is of epiblastic origin, as previously determined by Hensen and Flemming in the rabbit, Spee in the guinea-pig, Van Wijhe in the skate, J. von Perenyi in *Rana esculenta* and *Lacerta viridis*. Beard concludes his note with the presentation of a view almost identically the same as that previously urged by Haddon, to whom he, in fact, in a postscript, gives the credit of having been the first to suggest the origin of the segmental ducts and the establishment of their connection with the cloaca, as given in an abstract of Professor Haddon's paper, given in a recent number of this journal.

The Vestiges of a Zonary Decidua in the Mouse.—An account of some researches on this subject was given in the August number of this journal by the editor of this department. Since then, my assistant, Mr. Geo. Fetterolf, has prepared sections of some of the material in my possession, cut in such planes as to display the relations of the parts involved very clearly.

I find that the at first greatly thickened portion of the mucous membrane in the region of the embryos undergoes some very marked changes. At first the mucosa thickens very much around the embryo. This thickening forms a ring of tissue around the blastodermic vesicle. The only portion of this ring which persists is that which lies in the vicinity or on the site where the discoidal placenta is subsequently formed. The portions of the thickened ring of the mucous membrane on the side opposite the placenta and at the sides of the blastodermic vesicle are absorbed, as sections through the uterus and fœtus of a later stage prove. The hoop-like thickening which is continued from opposite sides of the placental region, and which encircles the fœtus and its membranes, is, as assumed in my previous note, nothing more or less than the transitory representative of a zonary or girdle-like decidua, all traces of which are lost before the end of fœtal life.

The mode in which this hypertrophied portion or annular band of the mucosa is absorbed is highly interesting. In the intermediate stages, at either side of the discoidal placenta and just where the maternal tissue of the placenta is continued into what was formerly the much thickened, but now nearly absorbed ring of thickened mucous membrane, there are found groups of huge cytoclasts or phagocytes, which are evidently the agents in the destructive metamorphosis of the abortive portion of the mucosa which has proceeded only a little way towards the formation of a zonary placenta. The presence of abortive villi on the surface of the chorion in the vicinity is a further proof of

[1] Anatomischer Anzeiger, ii., No. 21, p. 646, 1887.

this. The area of the *chorion frondosum* is very small, not over one-fourth of the area of the under side of the placental disk. The portion of the chorion underlying the placental disk, but not united with it, belongs to the *chorion lævе*, and its abortive villosities even extend over and are developed on its surface somewhat beyond the edge of the placental disk.

The cytoclasts spoken of above are many times the size of any of the rest of the cells found in the uterus, fœtus, or fœtal membranes, and they also possess very large nuclei. The processes of adjacent cytoclasts spoken of frequently join, and there is thus formed a sort of syncytium. This syncytial structure, if isolated, would form a ring composed of cytoclasts just at the edge of the placenta, and is especially developed at about the time the zonary band of mucous membrane around the fœtus is nearly absorbed.

These data furnish further proof that the primitive or ancestral type of placentation was a more diffuse one than in existing Rodents of the myomorph type, and throws some additional light on the manner in which a discoidal type of placentation has been derived from one which was zonary.—*J. A. Ryder.*

PSYCHOLOGY.

On Duration of Memory in Wasps.—In studying the psychology of insects, it is noteworthy that we have very little satisfactory evidence with regard to duration of memory. Belt's observation on leaf-cutting ants, which tends to show recollection of a locality for one year, is by no means conclusive, as the facts are as well, if not better explained by supposing that the ants accidentally stumbled upon the old vacant nest. Also with bees, the observations of both Stickney and Huber are inconclusive. Stickney's evidence on the subject, as given by Romanes,[1] is as follows:

"Stickney relates a case in which some bees took possession of a hollow place beneath a roof, and having been then removed into a hive, continued for several years to return and occupy the same hole with their successive swarms."

It would be hardly safe to conclude that bees have extended powers of memory from so indefinite an account as this.

Again we quote from Romanes:[2]

"Similarly Huber relates an observation of his own, showing the duration of memory in bees. One autumn he put some honey in a window, which the bees visited in large numbers. During the winter the honey was taken away and the shutters shut. When they were again opened in the spring, the bees returned, although there was no honey in the window."

The obvious criticism is that we have no evidence that the

[1] Animal Intelligence, p. 154. [2] L. c., p. 155.